CHAPTER 54

TRACKING SIGNAL

SECTION I - GENERAL

254101 - PURPOSE

To develop a mechanized procedure, employing mathematical formulas to measure and evaluate the difference between the quarterly forecast of demand and the demand for the forecast period, and to modify the QFD by indicating when a correcting alpha factor will be used.

254102 - REFERENCE

DLA Materiel Management System Requirements Study of July 1963, chapter III.

254103 - POLICY

a. The tracking signal measures the forecast errors and signals when the forecasts need to be corrected. The forecast error is the algebraic difference between the System Demand Forecast for a given time period and the demands that occur in that time period.

b. Numeric Stockage Objective items will be sorted out from replenishable demand items and eliminated from this procedure. Tracking signals will be computed based on the family number. Supply Status Codes 2, 3 and 6 items will be bypassed. New items will be eliminated from this procedure; however, a Mean Absolute Deviation (MAD) will be computed each forecast period based on actual demands vs exponential smoothed forecasts.

c. Tracking Limits - The tracking limit may be set at various limits for different items. The limits are based upon the standard deviation of demand. Initially two standard deviations will be used as the limit. The formula for tracking signal limit is to multiply the Number of Standard Deviations by the square root of pi, divided by two. Multiply that product by the square root of: two, minus two times alpha raised to the third power, plus alpha raised to the fourth power; divided by alpha times the following, four, minus alpha, minus four times alpha raised to the second power, plus two times alpha raised to the third power, i.e., Tracking Signal Limit =

$$\frac{S}{2}\sqrt{\frac{2-2(2a^3)+a^4}{a(4-a-4a^2+2a^3)}}$$

Where S is the number of standard deviations; alpha ( ) is the regular or correcting alpha; pi ( ) is a constant value of 3.1416. Final results are rounded to one decimal place.

d. Tracking Signal - The tracking signal is computed and compared to the tracking limits to determine if the forecast errors are out-of-limits. The tracking signal formula is the sum of algebraic errors divided by smoothed mean absolute deviation.

e. Corrective Action.

(1) When the tracking signal reflects that the demand is not within the limits prescribed, corrective action is taken if it is the second successive time period an out-of-track situation occurred in the same direction. The recurring demand forecast procedure will correct for the out-of-track condition by using the corrective alpha factor.

(2) While the recurring demand forecast procedure is taking corrective action, the tracking signal procedure utilizes the corrective alpha factor in the computation of the MAD of forecast errors. This action will tend to keep the item in track and will also prohibit an erroneous change in the variable safety level quantity.

f. Demand Data - The demand data utilized in the recurring demand forecast is also applicable to the tracking signal procedure; i.e., recurring demand plus whatever portion of nonrecurring demand is authorized.

g. Frequency of Tracking - The tracking signal procedure is the same frequency as the recurring demand forecast: Monthly for VIP items, quarterly for Non-VIP Items.

h. Alpha Factors - Alpha Factors may be stored in two places as follows:

(1) Supply Control Record - For individual family numbers.

(2) Management Policy Table - This table provides the capability of mass changes to alpha factors, i.e., by FSC, all Center commodities, VIP and Non-VIP.

Any alpha factor established in the Supply Control Record for a family will take precedence over any alpha factor entered in the Management Policy Table. When an out-of-track condition requires use of the corrective alpha factor, based on the alpha factor in the Supply Control Record, the regular alpha factor will be incremented by (.1) to obtain the correcting alpha factor. If the alpha factor in use is taken from the Management Policy Table, the corrective alpha factor will be obtained from the Management Policy Table.

254104 - SOURCE DATA

The source data for this procedure consists of:

a. Quarterly System Forecast of Demand at time p (the past) for the last time period. (Month for VIP, quarter for others.)

b. System recurring demand for the last time period.

c. System applicable nonrecurring demand for last time period to be used in demand forecast.

d. Out-of-Track Indicator.

e. Tracking Limits.

f. Cumulative algebraic sum of forecast errors.

g. Smoothed mean absolute deviation of forecast errors.

h. Alpha Factor for computing MAD of forecast errors.

i. Corrective alpha factor for computing MAD of forecast error.

j. Demand Value Code.

k. VIP Item Code.

l. Tracking Signal Correction Counter.

m. The smoothed MAD of forecast errors for the initial input will be the current MAD of the item. If the MAD is not available for an established item, it will be computed as follows:

(1) Obtain the total actual recurring demands and nonrecurring demands by quarter for the past year.

(2) Calculate the average demand by adding total actual demand for the four quarters and dividing the sum by four.

(3) Subtract the average demand from each of the quarterly demands and disregard the sign (±) of the difference.

(4) Add the differences together and divide by four for non-VIP; for VIP divide by 7. The result is the estimated MAD.

n. The frequency of using source data is monthly for VIP Items, quarterly for Non-VIP Items.

254105 - PRODUCT

a. Outputs - The outputs from this procedure consist of:

(1) Cumulative algebraic sum of forecast errors.

(2) Smoothed mean absolute deviation of forecast errors.

(3) Tracking Signal Correction Counter.

(4) Out-of-Track Indicator.

(5) Supply Control Study - F-167 Reason Code OT.

(6) Tracking Signal Report F-183.

b. The frequency of outputs is monthly for VIP Items, quarterly for Non-VIP Items.

SECTION II - PROCEDURES

254201 - PRELIMINARY EDITING

a. Check for replenishable demand items and eliminate numeric stockage objective items from this procedure. Tracking signals will be computed based on the family number.

b. New Items will be eliminated from this procedure. Refer to paragraph 254103b.

SECTION III - RECLASSIFICATION OF VIP ITEMS

254301 - ITEMS CHANGING FROM NON-VIP TO VIP ITEM CATEGORY

a. The tracking signal procedures is applicable to an item before and after migration. However, it will change from a quarterly basis to a monthly basis. The pertinent data elements will be converted to terms of months. This procedure must be compatible with the recurring demand forecast procedure for the same migration.

b. There are three sets of time conditions for updating the tracking signal to coincide with updating the recurring demand forecast for items subject to this procedure.

(1) If an item is reclassified during the first month after the quarterly forecast, the tracking signal data is adjusted to a monthly basis per paragraphs 254301c, d and e.

(2) If an item is reclassified during the second month after the quarterly forecast, the tracking signal will be applied as of the end of the second month following the end of the quarter. The tracking signal data is adjusted to a monthly basis per paragraphs 254301c, d and e.

(3) If an item is reclassified during the third month after the quarterly forecast, the tracking signal will be applied at the end of the first month following the end of the quarter. The tracking signal data is adjusted to a monthly basis per paragraphs 254301c, d and e.

c. To convert data elements to terms of months:

(1) Divide the existing cumulative algebraic sum of forecast errors by 3.

(2) The smoothed mean absolute deviation of forecast errors will be multiplied by a conversion factor of 0.577.

d. Transfer the Out-of-Track Indicator as it exists.

e. Transfer the Correction Counter as it exists.

f. Obtain the applicable alpha factor for computing MAD of forecast errors.

254302 - ITEMS CHANGING FROM VIP TO NON-VIP ITEM STATUS

a. The tracking signal procedure is applicable to an item before and after migration. However, it will change from a monthly basis to a quarterly basis. The pertinent data elements will be converted to terms of quarters. This procedure must be compatible with the recurring demand forecast procedure for the same migration.

b. If the date of the last monthly forecast does not correspond to the end of the last quarter, continue the item as a VIP until the end of the current quarter. If the date does correspond to the end of the last quarter, convert the data elements to terms of quarters as follows:

(1) Multiply the existing cumulative algebraic sum of forecast errors by 3.

(2) The smoothed MAD of forecast errors will be multiplied by a conversion factor of 1.732.

c. Transfer the Out-of-Track Indicator as it exists.

d. Transfer the Correction Counter as it exists.

e. Obtain the applicable alpha factor for computing MAD of forecast errors.